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TITLE: Entropy Generation across Earth's Bow Shock

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SESSION TITLE: SH53B. Kinetic Scale Fluctuations in the Solar Wind: Interplay of Dissipation, Dispersion, and Instabilities III Posters

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ABSTRACT BODY: Earth's bow shock is a transition layer that causes an irreversible change in the state of plasma that is stationary in time. Theories predict entropy increases across the bow shock but entropy has never been directly measured. Cluster and Double Star plasma experiments measure 3D plasma distributions upstream and downstream of the bow shock that allow calculation of Boltzmann's entropy function H and his famous H-theorem, $dH/dt \leq 0$. We present the first direct measurements of entropy density changes across Earth's bow shock. We will show that this entropy generation may be part of the processes that produce the non-thermal plasma distributions is consistent with a kinetic entropy flux model derived from the collisionless Boltzmann equation, giving strong support that solar wind's total entropy across the bow shock remains unchanged. As far as we know, our results are not explained by any existing shock models and should be of interests to theorists.

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